PTO 03-3367

CY=CN DATE=19991110 KIND=Patent
PN=1,234,404

METHOD OF ISOLATING D-RIBOSE FROM FERMENTATION LIQUID

[Cong Fajiaye-zhong Fenli D-Hetangde Fangfa]

Qu Weiran

UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. May 2003

Translated by: FLS, Inc.

PUBLICATION COUNTRY	(19):	CN
DOCUMENT NUMBER	(11):	1234404A
DOCUMENT KIND	(12):	
PUBLICATION DATE	(43):	19991110
APPLICATION NUMBER	(21):	99113547.4
APPLICATION DATE	(22):	19990322
INTERNATIONAL CLASSIFICATION	(51):	C07H 3/02 C12P 19/02
INVENTORS	(72):	Qu, Weiran
APPLICANT	(71):	Huadong University of Science and Engineering.
TITLE	(54):	METHOD OF ISOLATING D-RIBOSE FROM FERMENTATION LIQUID
FOREIGN TITLE	(54A):	Cong Fajiaye-zhong Fenli D-Hetangde Fangfa

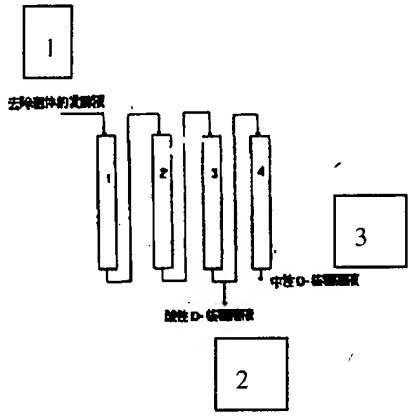
[54] Name of Invention /i*

Method of Isolating D-Ribose from Fermentation Liquid

[57] Abstract

This invention belongs to the field of biochemical engineering; it concerns a method of using an ion exchange resin to isolate D-ribose from fermentation liquid. In this invention, a fermentation liquid that has undergone pretreatment flows successively, at a linear speed of 1~3 m/hr, through a column with a strongly acidic cation exchange resin (1), a column with a weakly alkaline anion exchange resin (2), and a weakly acidic cation exchange resin (3), and the effluent is collected with a deionized water rinsing column, and then D-ribose is collected from the effluent by conventional methods, with a yield that is as high as over 95%.

[Figure]



Key: 1 - fermentation liquid with bacilli removed; 2 - acidic D-ribose solution; 3 - neutral D-ribose solution.

---

*Number in the margin indicates pagination in the foreign text.

PATENT CLAIMS /ii

1. A method of isolating D-ribose from fermentation liquid comprising three steps: (1) pretreatment of the fermentation liquid, (2) purification of the fermentation liquid, and (3) the aftertreatment of the purified liquid, which is characterized in that the purification of the fermentation liquid is carried out in the following manner:

The fermentation liquid that has undergone pretreatment flows, at a linear speed of 1~3 m/hr, through a column with a strongly acidic cation exchange resin (1), a column with a weakly alkaline anion exchange resin (2), and a weakly acidic cation exchange resin (3); it is then rinsed with deionized water and the effluent is collected; the optimal ratio of the fermentation liquid to the strongly acidic cation exchange resin and the weakly alkaline anion exchange resin is, respectively:

fermentation liquid : resin = (3~9) : 1 (volume ratio);

the optimal ratio of the fermentation liquid to the weakly acidic cation exchange resin is

fermentation liquid : resin = (6~18) : 1 (volume ratio).

2. The method of Claim 1 characterized in that the weakly acidic cation exchange resin (3) is followed in series with a weakly alkaline anion exchange resin (4), and the optimal ratio of the fermentation liquid thereto is

fermentation liquid : resin = (6~18) : 1 (volume ratio).

3. The method of Claims 1 -2 characterized in that the strongly acidic cation exchange resin of column (1) is one kind [selected] from among 732, 0.001 x 7 strongly acidic phenylethylene cation exchange resin, or Amberlite IR-120; the weakly alkaline anion exchange resin of column (2) is one kind [selected] from among D-315 macroporous weakly alkaline acrylic acid anion exchange resin, weakly alkaline 330 resin, D309, D396, D351, 709, Amberlite IRA-63 or IRA-94; the weakly acidic anion exchange resin of column (3) is one kind [selected] from among HD-1 macroporous phenol aledhyde weakly acidic resin, 122 or 125; the weakly alkaline anion exchange resin of column (4) is one kind [selected] from among D-315 macroporous weakly alkaline acrylic acid anion exchange resin, weakly alkaline 330 resin, D309, D396, D351, 709, Amberlite IRA-63 or IRA-94.

SPECIFICATIONS /1

This invention belongs to the field of biochemical engineering; in particular, it concerns a method of using an ion exchange resin to isolate D-ribose from fermentation liquid.

D-ribose is a nucleic acid component that plays a major role in biological processes, its derivatives also are essential components of some vitamins and coenzymes; it can be used as a precursor of the B2 vitamin and as raw material for various riboside

medications and seasonings. Therefore it is widely used in the field of biochemical engineering.

Before the 80ies, in foreign countries it was mostly synthesized by chemical methods, but currently D-ribose produced by a transketolase affected mutant strain of *bacillus subtilis* is widely used; and in the 90-ies, China began to domestically use D-ribose produced by the fermentation method. The use of fermentation-produced D-ribose requires that D-ribose be extracted from the mixture in the fermentation liquid. The Japanese patent 56-113297 discloses a method of extracting D-ribose from the mixture in the fermentation liquid, and currently industrial production is carried out using this method. In this method, first, bacilli are removed by centrifuging, and then the cations and anions of the fermentation liquid are removed by running the supernatant through the strongly acidic cation exchange resin Amberlite IR-120 (type H) and the strongly alkaline anione exchange resin Amberlite IRA-400 (type OH). Then the liquid is concentrated, crystallized, and the D-ribose product is obtained. When D-ribose is isolated from the fermentation liquid by the above-mentioned method, there are major losses, and the D-ribose yield is fairly low if the D-ribose concentration in the fermentation liquid is fairly high. When the D-ribose concentration of the fermentation liquid is fairly low, such as 20~25 g/l, the yield is only 40~50%. The reason is that the isoelectric point of the D-ribose hydroxyl group is 12; when pH is 12, numerous hydroxyl

groups dissociate and form a negative electric charge; when ions are exchanged with the ions produced by the strongly alkaline anionic exchange group, such combinations are very hard to rinse off with water, which forces the D-ribose yield down. Moreover, the large amounts of coloring matter present in the fermentation liquid also frequently affect the product purity, and though activated charcoal can be used to remove coloring, it is not very effective, and frequently only brown treacle can be obtained. Therefore, new methods of isolating and extracting D-ribose from the mixture of the fermentation liquid must be examined, to satisfy the needs of production facilities.

The purpose of this invention is to disclose a new method of isolating D-ribose from the fermentation liquid. In this method, the strongly alkaline anion exchange resin that is currently used is replace with weakly alkaline anion exchange resin and supplemented by weakly acidic cation exchange resin to form an efficient, improved impurity removal composite system that has low D-ribose losses for use in the purification of the D-ribose fermentation liquid, to overcome the low yield deficiency of the current technology. /2

The design concept of this invention is as follows:

When the fermentation liquid runs through a strongly acidic cation exchange resin, the solution exhibits acidity, whereas the pH exchange range of the weakly alkaline anion exchange resin is 0~8;

generally inorganic anions still can exchange therewith and be adsorbed by it. However, the D-ribose dissociation pH value is 12, and therefore basically it is not absorbed, thus, once inorganic ions within the fermentation liquid, such as $SO_4^{=}$, PO_4^{-4}, and Cl^{-1}, etc., are removed, losses and yield reduction stemming from the adsorption of D-ribose can be avoided; in addition, this weakly alkaline anion exchange resin can adsorb the coloring matter in the fermentation liquid, thus increasing D-ribose purity.

This invention has also been implemented in the above manner.

The method of this invention includes three parts:

(1) pretreatment of the fermentation liquid

(2) purification of the fermentation liquid

(3) aftertreatment of the purified liquid.

Below, we will describe it in detail:

(1) Pretreatment of the fermentation liquid: the fermentation liquid or flocculant-added fermentation liquid is filtered with a centrifuge or a filter-press to remove bacilli and solid impurities. Since the description is available in numerous publications, we will not dwell on it in this invention.

(2) Purification of the fermentation liquid: This process is represented in Fig. 1. In the figure,

1 --- a column strongly acidic cation exchange resin

2 --- a column of weakly alkaline anion exchange resin

3 --- a column of weakly acidic cation exchange resin

4 --- a column of weakly alkaline anion exchange resin

The fermentation liquid with bacilli and solid impurities removed, has a D-ribose content of about 40 g/L; it contains calcium, magnesium, potassium, sodium, and other cations as ell as sulfuric acid radicals, phosphoric acid radicals, chlorions, and other anions; the solution is brown. This fermentation liquid is run, at a flow rate of 1~3 m/hr, successively, through the column **1** of strongly acidic cation exchange resin, column **2** of weakly alkaline anion exchange resin, and column **3** of weakly acidic cation exchange resin, whereupon it is also rinsed through deionized water column and the D-ribose is rinsed off the top of the column, and a colorless supernatant is obtained - a D-ribose containing fermentation liquid with cations and anions removed. The principal role of the column **1** of strongly acidic cation exchange resin is to remove the calcium, magnesium, potassium, and sodium cations from the solution; the principal role of the column **2** of weakly alkaline anion exchange resin is to remove the sulfuric acid radicals, phosphoric acid radicals, chlorions, and other anions, as well as a large part of the coloring matter, from the solution; the principal role of column **3** of weakly acidic cation exchange resin is to remove the residual /3

coloring matter from the solution. The fermentation liquid thus obtained exhibits acidity, and its pH is 3~5, while its D-ribose content generally is about 30 g/L. In order to obtain a neutral fermentation liquid and further remove the residual minute amounts of coloring matter from the solution, another column, the column **4** of weakly alkaline anion exchange resin can be added to obtain a high-grade D-ribose product.

The strongly acidic cation exchange resin of column **1** is one kind [selected] from among 732, 0.001 x 7 strongly acidic phenylethylene cation exchange resin, or Amberlite IR-120;

the weakly alkaline anion exchange resin of column **2** is one kind [selected] from among D-315 macroporous weakly alkaline acrylic acid anion exchange resin, weakly alkaline 330 resin, D309, D396, D351, 709, Amberlite IRA-63 or IRA-94. There is a certain ratio between the amount of resin used and the amount of fermentation liquid used; the optimal ratio of the fermentation liquid to the strongly acidic cation exchange resin and the weakly alkaline anion exchange resin is, respectively:

fermentation liquid : resin = (3~9) : 1 (volume ratio).

The weakly acidic anion exchange resin of column **3** is one kind [selected] from among HD-1 macroporous phenol aledhyde weakly acidic resin, 122 or 125. Here, the optimal ratio is:

fermentation liquid : resin = (6~18) : 1 (volume ratio).

The weakly alkaline anion exchange resin of column **4** is one kind [selected] from among D-315 macroporous weakly alkaline acrylic acid anion exchange resin, weakly alkaline 330 resin, D309, D396, D351, 709, Amberlite IRA-63 or IRA-94. Here, the optimal ratio is:

fermentation liquid : resin = (6~18) : 1 (volume ratio).

(3) Aftertreatment of the purified liquid: The D-ribose containing fermentation liquid of the colorless supernatant obtained in step (2) can undergo concentration, crystallization, and separation by conventional methods to ultimately obtain the D-ribose product.

When the above-described method of this invention is applied in isolating D-ribose from the fermentation liquid, the operation is streamlined, D-ribose yield can exceed 95%, and the D-ribose product purity is high, therefore, this is an isolation method that has good prospects for industrial application.

Below we will further explain the details of this invention with examples.

Example 1

Bacilli were removed from the fermentation liquid by centrifuging at a rotary velocity of 8000 rpm for 30 min. The D-ribose content of the solution was 36 g/L, and this solution was successively run, at a linear speed of 1.5 m/hr, through resin

columns with 732 resin, D-315 resin, and HD-1 resin. The amount of 732 resin used was 300 ml, and the column dimensions were ϕ 26 x 800 mm; the amount of D-315 resin used was 300 ml, and the column /4 dimensions were ϕ 26 x 800 mm; the amount of HD-1 resin used was 150 ml, and the column dimensions were ϕ 26 x 600 mm. When the above was completed, the fermentation liquid was also rinsed with 1000 ml deionized water, and the liquid effluent from the resin column was a colorless transparent liquid. The absence of Cl^- was tested with silver nitrate. 1200 ml of D-ribose containing effluent was collected; its D-ribose content was 28.8 g/L. its pH value was 5, and its yield was 96% (wt%). The effluent was concentrated, crystallized, and vacuum-dried, whereupon D-ribose product could be obtained; its purity could be as high as 98%.

Example 2

Bacilli were removed from the fermentation liquid by centrifuging to obtain a solution with the D-ribose content of 40 g/L. 40 L of such solution was successively run, at a linear speed of 2 m/hr, through four columns. The above-mentioned resin columns were filled with 732 resin, D-315 resin, and HD-1 resin, and D-315 resin. The amount of 732 resin used was 10 L, and the column dimensions were ϕ 150 x 1000 mm; the amount of D-315 resin used was 10 L, and the column dimensions were ϕ 150 x 1000 mm; the amount of HD-1 resin used was 5 L, and the column dimensions were ϕ 100 x 1000 mm; the amount

of D-315 used in the fourth resin column was 5 L, and the column dimensions were ϕ 100 x 1000 mm. When the above was completed, the fermentation liquid was also rinsed with 50 L deionized water, and the liquid effluent from the resin column was 65 L of colorless transparent liquid; its D-ribose content was 22.6 g/L. its pH value was 7, and its yield was 92% (wt%). The effluent was concentrated, crystallized, and vacuum-dried, whereupon D-ribose product could be obtained; its purity could be as high as 98%.

Example 3

Bacilli were removed from the fermentation liquid by centrifuging to obtain a solution with the D-ribose content of 36 g/L. 1000 ml of this solution was successively run, at a linear speed of 1.5 m/hr, through resin columns with 732 resin, Amberlite IRA-63 resin, and 122 resin. The amount of 732 resin used was 300 ml, and the column dimensions were ϕ 26 x 800 mm; the amount of Amberlite IRA-63 resin used was 300 ml, and the column dimensions were ϕ 26 x 800 mm; the amount of HD-1 [sic! - translator's note] resin used was 150 ml, and the column dimensions were ϕ 26 x 600 mm. When the above was completed, the fermentation liquid was also rinsed with 1000 ml deionized water, and 1200 ml of liquid effluent was collected. Its D-ribose content was 28.2 g/L. its pH value was 4, and its yield was 94% (wt%). The effluent was concentrated,

crystallized, and vacuum-dried, whereupon D-ribose product could be obtained; its purity could be as high as 95%.

Attachment to Specifications

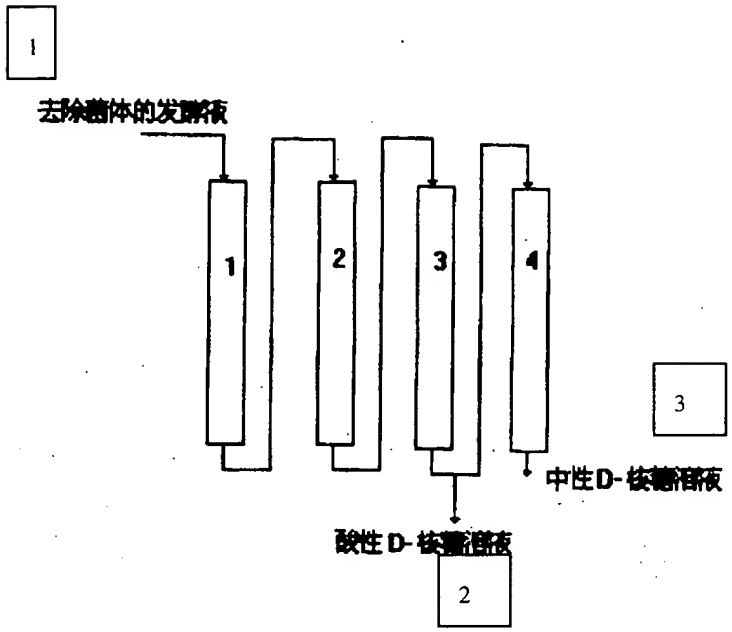


Fig. 1

Key: 1 - fermentation liquid with bacilli removed; 2 - acidic D-ribose solution; 3 - neutral D-ribose solution.

[19]中华人民共和国国家知识产权局

[51]Int.Cl[6]
C07H 1/06
C07H 3/02 C12P 19/02

[12]发明专利申请公开说明书

[21]申请号 99113547.4

[43]公开日 1999年11月10日

[11]公开号 CN 1234404A

[22]申请日 99.3.22 [21]申请号 99113547.4

[71]申请人 华东理工大学
地址 200237 上海市梅陇路130号
共同申请人 苏州市宏达集团有限公司
[72]发明人 邱蔚然

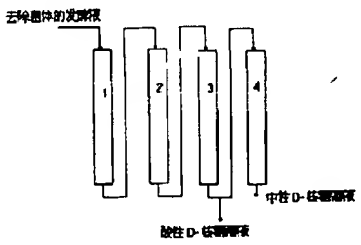
[74]专利代理机构 华东理工大学专利事务所
代理人 罗大忱

权利要求书1页 说明书4页 附图页数1页

[54]发明名称 从发酵液中分离D-核糖的方法

[57]摘要

本发明属于生物化学工程领域，涉及一种采用离子交换树脂从发酵液中分离D-核糖的方法。本发明将经过前处理后的发酵液以1～3米/小时的线速按序流过强酸性阳离子交换树脂柱(1)、弱碱性阴离子交换树脂柱(2)、弱酸性阳离子交换树脂柱(3)，并以去离子水洗柱，收集流出液，并用常规的方法从流出液中收集D-核糖，其收率可达95%以上。



ISSN1008-4274

权 利 要 求 书

1. 一种从发酵液中分离 D-核糖的方法,包括三个步骤: (1) 发酵液的前处理,(2) 发酵液的纯化,(3) 纯化液的后处理,其特征在于发酵液的纯化是这样进行的:

将前处理后的发酵液以 1 ~ 3 米/小时的线速按序流过强酸性阳离子交换树脂柱(1)、弱碱性阴离子交换树脂柱(2)、弱酸性阳离子交换树脂柱(3),并以去离子水洗柱,收集流出液,发酵液与强酸性阳离子交换树脂和弱碱性阴离子交换树脂的最佳比例分别为:

发酵液：树脂 =(3 ~ 9)： 1(体积比)

发酵液与弱酸性阳离子交换树脂的最佳比例为:

发酵液：树脂 =(6 ~ 18)： 1(体积比).

2. 如权利要求 1 所述的方法,其特征在于: 弱酸性阳离子交换树脂(3)的后面再串联一根弱碱性阴离子交换树脂(4),发酵液与其最佳比例为:

发酵液：树脂 =(6 ~ 18)： 1(体积比).

3. 如权利要求 1 — 2 所述的方法,其特征在于: 树脂柱(1)中的强酸性阳离子交换树脂为 732 、 0.01 × 7 强酸性苯乙烯阳离子交换树脂或 Amberlite IR-120 中的一种; 树脂柱(2)中的弱碱性阴离子交换树脂为 D-315 大孔径弱碱丙烯酸系阴离子交换树脂、弱碱 330 树脂、 D301 、 D309 、 D396 、 D351 、 709 、 Amberlite IRA-63 或 IRA-94 中的一种; 树脂柱(3)中的弱酸性阳离子交换树脂为 HD-1 大孔酚醛系弱酸树脂、 122 或 125 中的一种; 树脂柱(4)中的弱碱性阴离子交换树脂为D-315大孔径弱碱丙烯酸系阴离子交换树脂、弱碱 330 树脂、D301 、 D309 、 D396 、 D351 、 709 、 Amberlite IRA-63 或 IRA-94 中的一种.

说　明　书

从发酵液中分离 D-核糖的方法

本发明属于生物化学工程领域,涉及发酵液中 D-核糖的一种分离方法,尤其涉及一种采用离子交换树脂进行分离的方法.

D-核糖,英文名为 D-Ribose,是生命中起着重要作用的核酸的一个组成部分,它的衍生物亦是某些维生素与辅酶的重要成分. 可以作为维生素 B_2 的中间体,也可作为各种核苷类药物和调味品的原料,因此,在生物化学工程领域有着十分广泛的应用.

八十年代以前,国外主要采用化学的方法进行合成,目前已广泛采用枯草芽孢杆菌的转酮醇酶突变株生产 D-核糖. 九十年代起,国内开始采用发酵法生产 D-核糖. 采用发酵法生产 D-核糖,需要从发酵液的混合物中分离提取 D-核糖. 日本公开特许公报 56-113297 公开了一种从发酵液的混合物中分离提取 D-核糖的方法,目前工业上也是采用这种方法进行生产的. 该方法首先将发酵液用离心机去除菌体,然后将清液通过强酸性阳离子交换树脂 Amberlite IR-120(H 型)和强碱性阴离子交换树脂 Amberlite IRA-400(OH 型),去除发酵液中的阳离子和阴离子,然后浓缩、结晶,获得 D-核糖产品. 采用上述方法从发酵液中分离提取 D-核糖,损失很大,D-核糖的收率较低,当发酵液中 D-核糖的浓度较高时,一般为 70 ~ 80%,当发酵液中 D-核糖的浓度较低时,如每升含量为 20 ~ 25 克时,其收率仅为 40 ~ 50%. 其原因是 D-核糖羟基等电点为 12,当 pH 为 12 时,有较多的羟基解离,形成负电荷,与强碱性阴离子交换树脂发生离子交换,这种结合很难用水洗脱,致使 D-核糖收率降低. 另外,发酵液中存在的大量色素也往往影响产品的纯度,虽然可采用活性炭脱色,但其效果较差,往往只能获得棕色糖浆. 因此,必须研究一种新的从发酵液的混合物中分离提取 D-核糖的方法,以满足产业部门的需要.

本发明的目的在于公开一种新的从发酵液中分离 D-核糖的方法. 该方法以弱碱性阴离子树脂取代现有技术中使用的强碱性阴离子交换树脂,并辅以弱酸性阳离子树脂,形成一个去除杂质效率高、 D-核糖损失少的优化组合体系,用于纯

化 D-核糖发酵液,以克服现有技术存在的收率不高的缺陷.

本发明的构思是这样的:

当发酵液通过强酸性阳离子交换树脂后,溶液呈酸性,而弱碱性阴离子交换树脂 pH 交换范围为 0 ~ 8,一般无机阴离子仍可与其交换而被吸附,而 D-核糖的离解 pH 值为 12,因此基本上不被吸附,这样,既除去了发酵液中的无机阴离子,如 $SO_4^{=}$、PO_4^{-4}和 Cl^{-1}等,又可使 D-核糖避免因吸附而造成损失,降低收率; 该弱碱性阴离子交换树脂还可吸附发酵液中的色素,以提高 D-核糖的纯度.

本发明亦是这样实现的:

本发明所说的方法包括三个部分:

(1) 发酵液的前处理

(2) 发酵液的纯化

(3) 纯化液的后处理

详细过程如下所述:

(1) 发酵液的前处理: 将发酵液或添加了絮凝剂的发酵液用离心机或压滤机进行过滤,去除菌体和固体杂质. 许多文献中对此都有论述,本发明不再赘述.

(2) 发酵液的纯化: 图 1 为该过程的示意图. 图中:

1 ————强酸性阳离子交换树脂柱

2 ————弱碱性阴离子交换树脂柱

3 ————弱酸性阳离子交换树脂柱

4 ————弱碱性阴离子交换树脂柱

去除了菌体和固体杂质的发酵液,D-核糖的含量约为40g/L左右,其中含有钙、镁、钾、钠等阳离子和硫酸根、磷酸根和氯根等阴离子,溶液呈深棕色. 将该发酵液以 1 ~ 3 米/小时的流速按序流过强酸性阳离子交换树脂柱 1 、弱碱性阴离子交换树脂柱 2 、弱酸性阳离子交换树脂柱 3,并以去离子水洗柱,将留存在柱内的 D-核糖顶洗出来,获得去除了阳离子和阴离子的无色澄清的含有 D-核糖的发酵液. 强酸性阳离子交换树脂柱 1 的主要作用是去除溶液中的钙、镁、钾、钠等阳离子; 弱碱性阴离子交换树脂柱 2 的主要作用是去除溶液中的硫酸根、磷酸根和氯根等阴离子和大部分色素; 弱酸性阳离子交换树脂柱 3 的主要作用

是去除溶液中残存的色素．这样所得到的发酵液呈酸性,其 pH 值为 3 ~ 5,D-核糖的含量一般可达30g/L左右．为了获得中性的发酵液和进一步脱除残存于溶液中的极少量色素,还可添加一根弱碱性阴离子交换树脂柱 4,以获得高品位的 D-核糖产品．

树脂柱 1 中的强酸性阳离子交换树脂为 732 、 001 × 7 强酸性苯乙烯阳离子交换树脂或 Amberlite IR-120 等中的一种;

树脂柱 2 中的弱碱性阴离子交换树脂为 D-315 大孔径弱碱丙烯酸系阴离子交换树脂、弱碱 330 树脂、 D301 、 D309 、 D396 、 D351 、 709 、 Amberlite IRA-63 或 IRA-94 等中的一种．树脂的用量与发酵液的用量有一定的比例,发酵液与强酸性阳离子交换树脂和弱碱性阴离子交换树脂的最佳比例分别为:

发酵液：树脂 =(3 ~ 9)： 1(体积比)

树脂柱 3 中的弱酸性阳离子交换树脂为 HD-1 大孔酚醛系弱酸树脂、 122 或 125 等中的一种．其最佳比例为:

发酵液：树脂 =(6 ~ 18)： 1(体积比)

树脂柱 4 中的弱碱性阴离子交换树脂为D-315大孔径弱碱丙烯酸系阴离子交换树脂、弱碱330树脂、 D301 、 D309 、 D396 、 D351 、 709 、 Amberlite IRA-63 或 IRA-94 等中的一种．其最佳比例为:

发酵液：树脂 =(6 ~ 18)： 1(体积比)

(3) 纯化液的后处理: 步骤(2)所获得的无色澄清的含有 D-核糖的发酵液可以通过浓缩、结晶等常规的分离方法最终获得成品 D-核糖．

采用本发明所说的方法从发酵液中分离 D-核糖,操作简便易行,D-核糖的收率可高达 95%以上,产品 D-核糖的纯度高,因此确为一种具有工业应用前景的分离方法．

下面将通过实施例对本发明的有关细节作进一步的阐述．

实施例 1

将发酵液以 8000rpm 转速离心 30min 去除菌体,溶液中 D-核糖的含量为 36 克/升,将该溶液 1.5 米/小时的线速依次流过装有 732 树脂、 D-315 树脂和 HD-1 树脂的树脂柱,其中 732 树脂用量为 300 毫升,树脂柱尺寸为 ϕ 26 × 800mm,D315

树脂用量为 300 毫升,树脂柱尺寸为 ϕ 26 × 800mm,HD-1 树脂用量为 150 毫升,树脂柱尺寸为 ϕ 26 × 600mm,发酵液上样完毕后,再用 1000 毫升去离子水洗涤.从树脂柱流出的溶液为无色透明溶液,用硝酸银检验无 Cl^-,收集含有 D-核糖的流出液 1200 毫升,D-核糖的含量为 28.8 克/升,pH 值为 5,收率为 96%(wt%). 将该流出液浓缩、结晶和真空干燥后可得成品 D-核糖,其纯度可达 98%.

实施例 2

将发酵液离心过滤除菌,获得 D-核糖含量为 40 克/升的溶液,将该溶液 40 升以 2 米/小时的线速依次流过四根树脂柱,所说的树脂柱分别装有 732 树脂、 D-315 树脂、 HD-1 树脂和 D-315 树脂. 其中: 732 树脂用量为 10 升,树脂柱尺寸为 ϕ 150 × 1000mm; D315 树脂用量为 10 升,树脂柱尺寸为 ϕ 150 × 1000mm; HD-1 树脂用量为 5 升,树脂柱尺寸为 ϕ 100 × 1000mm; 第四根树脂柱中 D315 树脂的用量为 5 升,树脂柱尺寸为 ϕ 100 × 1000mm; 发酵液上样完毕后,再用 50 升去离子水洗涤,收集无色透明的流出液 65 升,D-核糖的含量为 22.6 克/升,pH 值为 7,收率为 92%(wt%). 将该流出液浓缩、结晶和真空干燥后可得成品 D-核糖,其纯度可达 98%.

实施例 3

将发酵液离心过滤除菌,获得 D-核糖含量为 36 克/升的溶液,将该溶液 1,000 毫升以 1.5/小时的线速依次流过装有 732 树脂、 Amberlite IRA-63 树脂和 122 树脂的树脂柱. 其中: 732 树脂用量为 300 毫升,树脂柱尺寸为 ϕ 26 × 800mm, Amberlite IRA-63 树脂用量为 300 毫升,树脂柱尺寸为 ϕ 26 × 800mm,HD-1 树脂用量为 150 毫升,树脂柱尺寸为 ϕ 26 × 600mm,发酵液上样完毕后,再用 1000 毫升去离子水洗涤,收集流出液 1200 毫升,D-核糖的含量为 28.2 克/升,pH 值为 4,收率为 94%(wt%). 将该流出液浓缩、结晶和真空干燥后可得成品 D-核糖,其纯度可达 95%.

说 明 书 附 图

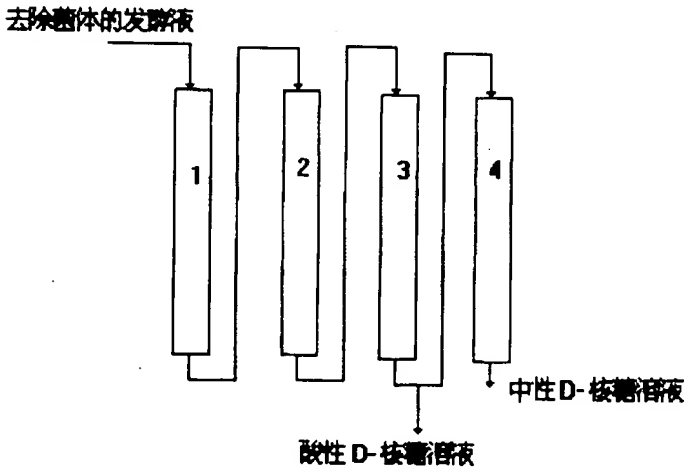


图 1